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EXAMINER	
AHMED, SAMIR ANWAR	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/659,815	Applicant(s) HATTORI ET AL.	
	Examiner Samir A. Ahmed	Art Unit 2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) *6-16 and 22-32* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 17-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4,5,6,7*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. Applicant's election with traverse of species I (claims 1-5 and 17-21) in Paper No. 9 is acknowledged. The traversal is on the ground(s) that a search and examination of the entire application would not place a serious burden on the Examiner, whereas it would be a serious burden on Applicants. This is not found persuasive because the species are distinct and independent and do not relate to a single inventive concept as evidenced by the disclosure of each species in a separate patent application priority document. The four species are disclosed separately in four Japanese Patent Applications. The subject matter in the claims of the species lack unity of invention and the species are not obvious variants. Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-5, 17-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 1 recites the limitation "the individual images" in line 9. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 4/1, 17, 20/17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Onoguchi Kazunori (Japanese Patent Publication 11-102440) "referred to as Onoguchi'440" and Onoguchi (U.S. Patent 5,694,483) "referred to as Onoguchi' 483". Note, (U.S. Patent 6,205,242 is used as an Official translation of the subject matter disclosed in Japanese Patent Publication 11-102440).

As to claim 1,Onogouchi'440 discloses an obstacle detection system comprising:

a plurality of TV cameras for inputting multiple images (Fig. 1, TV cameras 1-N);

an image storage unit for storing a plurality of images inputted from said TV cameras (Fig. 1, image memory 1-N);

a parameter computation unit for determining a relation to hold between the projected positions of an arbitrary point on said plane upon the individual images, from the lines extracted by said feature extraction unit [each image is mapped onto a predetermined plane in a 3D space and a plurality of positions of sample points (parameters) are measured and the plane equation including the sample points (a relation to hold between the projected positions of an arbitrary point on said plane upon

the individual images) is determined . In this case a cross point area including a marked crosswalk (lines exiting in a plane) being monitored, a plurality of sample points are set on the road and positions of the sample points are determined (a relation to hold between the projected positions of an arbitrary point on said plane upon the individual images is determined from the marked crosswalk (lines)) (col. 4, lines 1-28 and Fig. 3)]; and

a detection unit for detecting a region absent from said plane, by using the relation computed by said parameter computation unit [two projection data of same position on the plane P are compared and extracts an area R consisting of positions, the two projection data being different (col. 5, lines 39-42). More specifically, as shown in Fig. 8, for a point S' on the predetermined plane P, a projection point from TV camera 1 is the same as a projection point from camera 2, in this case the difference in intensity Dif (i, j) is zero (i.e., the detected region is absent from the plane). On the other hand, for a head point S of the pedestrian (obstacle), the projection point Vi from TV camera 1 is different from the projection point Ui from camera 2. In this case the difference in intensity Dif (i, j) is not zero it is of value "1" (col. 5, line 54- col. 6, line48, Fig. 8)].

Onoguchi'440, clearly determines the positions of a plurality of sample points set on a cross point area on a road including a marked crosswalk (marked crosswalk is lines existing on the road) (col. 4, lines 5-13), and it is clear that in order to determine the plurality of sample points set on the marked crosswalk (lines) of the road, the marked crosswalk has to be detected. Onoguchi'440 does not explicitly disclose

a feature extraction unit for extracting lines existing on a plane in a three-dimensional space, from the images.

Onoguchi'483 discloses extracting a particular area from a road using stereo images (col. 3, lines 7-13). Extracting two pairs of white lines corresponding to edges of a road from a left image and a right image. Next, the stereo computation section extracts sample points from the two pairs of edges on each image and calculates the positions of the sample points in 3D space. Then, a plane calculation section calculates the equation of a plane according to the positions of the sample points (a relation to hold between the projected positions of an arbitrary point on said plane upon the individual images). A projection section, project the positions of each pixel of the left image and the right image onto a plane corresponding to the equation (col. 3, line54-col. 4, line10). One of ordinary skill in the art would recognize from Onoguchi'483's teaching that in order to calculate or determine the plurality of sample points set on the marked crosswalk (lines) of the road disclosed in Onoguchi'440, the two pairs of white lines corresponding to edges of the marked crosswalk set on the road have to be first extracted and next extracts sample points from the two pairs of edges on each image and calculates the positions of the sample points in 3D space as taught by Onoguchi'483. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Onoguchi'483's teachings to modify Onoguchi'440's system by extracting lines existing on a plane in a three-dimensional space, from the images in order to accurately and correctly extract road areas from images without mistakenly extract other objects such as a building by the side of the road.

As to claim 4/1, Onoguchi'483 further discloses, wherein said feature extraction unit extracts a plurality of lines, as existing on the plane in the three-dimensional space and parallel to each other in the three-dimensional space, from the images [Fig. 10, shows the two lines of the road are spaced a distance W and run parallel to each other in the 3D space of plane P], and determines the vanishing points of said lines [Fig. 3, shows the cross point (vanishing point) of the lines is determined].

As to claim 17 refer to claim 1 rejection.

As to claim 20/17 refer to claim 4/1 rejection.

7. Claims 2, 3/1, 3/2, 4/2, 4/3 and 18, 19/17, 19/18, 20/18, 20/19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Onoguchi Kazunori (Japanese Patent Publication 11-102440) "referred to as Onoguchi'440" and Onoguchi (U.S. Patent 5,694,483) "referred to as Onoguchi' 483" as applied to claims 1 and 17 above and further in view of Applicant's Admitted Prior Art (page 3, line 4-page 4, line18).

As to claim 2, neither Onoguchi'440 nor Onoguchi'483 discloses, wherein said TV cameras are unknown on their relative positions and orientations and on their focal lengths and principal points.

Applicant's admitted prior art discloses that in an ordinary stereovision system it is necessary to determine in advance the spacing and directions of the plurality of cameras and the focal lengths and the principal points of the camera lenses. This work for determining these parameters is called calibration. However calibration require a long time and many works. If the ground region and the obstacle region on the images

are sufficiently separated, the calibrations are not necessarily required. If the projected points of a point of the ground plane on the left and right images are designated (Ul,Vl) and (Ur,Vr), equation 1 is a relation to hold. Parameters h depend upon the locations and positions of the individual cameras with respect to the ground plane and upon the focal lengths and image origins of the lenses of the individual cameras. Parameters h are predetermined from the projected points of the ground plane on the left and right images (page3, line 4-page 4, line 18), i.e., by predetermining parameters h, no calibration is required for the stereo vision camera system and the spacing and directions of the plurality of cameras and the focal lengths and the principal points of the camera lenses are not required to be determined or known in advance. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Applicant's admitted prior art teachings to modify the combined system of Onoguchi'440 and Onoguchi'483 by predetermining parameters h in advance to avoid calibrating the TV cameras (i.e. not determining in advance the spacing and directions of the plurality of cameras and the focal lengths and the principal points of the camera lenses) in order to avoid the calibration operations of the cameras that require a long time and many work.

As to claim 3/1 or 3/2, Applicant's admitted prior art further discloses, wherein the relation to hold between the projected points of an arbitrary point on the plane in the three-dimensional space upon the individual images is expressed by a two-dimensional affine transformation thereby to determine the affine transformation parameters

[equation 1 the relation to hold expressed in a two dimensional affine transformation, and parameters h are affine transformation parameters].

As to claim 18 refer to claim 2 rejection.

As to claim 19/17 or 19/18 refer to claim 3/1 or 3/2 rejections.

As to claims 4/2 or 4/3, Onoguchi'483 further discloses, wherein said feature extraction unit extracts a plurality of lines, as existing on the plane in the three-dimensional space and parallel to each other in the three-dimensional space, from the images [Fig. 10, shows the two lines of the road are spaced a distance W and run parallel to each other in the 3D space of plane P], and determines the vanishing points of said lines [Fig. 3, shows the cross point (vanishing point) of the lines is determined].

As to claims 20/18 or 20/19 refer to claim 4/2or 4/3 rejections.

8. Claims 5/1 and 21/17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Onoguchi Kazunori (Japanese Patent Publication 11-102440) "referred to as Onoguchi'440" and Onoguchi (U.S. Patent 5,694,483) "referred to as Onoguchi' 483" as applied to claims 1 and 17 above and further in view of K. Storjohann et al., "Visual Obstacle Detection For Automatically Guided Vehicles", IEEE International Conference on Robotics and Automation, p761-766, 1990.

As to claim 5/1, Onoguchi'483 further discloses, wherein said feature extraction unit extracts a plurality of lines, as existing on the plane in the three-dimensional space and parallel to each other in the three-dimensional space, from the images [Fig. 10, shows the two lines of the road are spaced a distance W and run parallel to each other in the 3D space of plane P], and the vanishing points of said lines [Fig. 3, shows the

cross point (vanishing point) of the lines is determined]. Neither Onoguchi'440 nor Onoguchi' 483

determines the inclinations of said lines on the images.

Storjohann discloses an inverse perspective mapping for detecting an obstacle by projecting the image of a scene onto a plane different from the image plane (Page 761, RC, lines 23-25), by mapping a point in the image plane onto a point in a plane slanted (inclined) by an angel and determines the inclination (page 762, LC, equation 1). The map of free space is the projection of all lines of sights onto a plane representing the floor up to the point where the respective line of sight stops. The inverse perspective mapping offers an efficient way of computing the map of free space for a broad range of applications of automatically detecting an obstacle. An obstacle is modeled as any visible surface patch whose 3D position has a non-vanishing Z component in an XYZ coordinate system with the XY-plane representing the floor (Z=0) (page 763, RC, lines 16-33, Figs 8, 9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Storjohann teachings to modify the combined system of Onoguchi'440 and Onoguchi'483 by determines the inclinations of said lines on the images in order to efficiently computing the map of free space for a broad range of applications of automatically detecting an obstacle.

As to claim 21/17 refer to claim 5/1 rejection.

9. Claims 5/2, 5/3, 21/18, 21/19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Onoguchi Kazunori (Japanese Patent Publication 11-102440) "referred to as Onoguchi'440", Onoguchi (U.S. Patent 5,694,483) "referred

to as Onoguchi' 483", and Applicant's Admitted Prior Art (page 3, line 4-page 4, line18) as applied to claims 2, 3, 18 and 19 above and further in view of K. Storjohann et al., "Visual Obstacle Detection For Automatically Guided Vehicles", IEEE International Conference on Robotics and Automation, p761-766, 1990.

As to claims 5/2 or 5/3, Onoguchi'483 further discloses, wherein said feature extraction unit extracts a plurality of lines, as existing on the plane in the three-dimensional space and parallel to each other in the three-dimensional space, from the images [Fig. 10, shows the two lines of the road are spaced a distance W and run parallel to each other in the 3D space of plane P], and the vanishing points of said lines [Fig. 3, shows the cross point (vanishing point) of the lines is determined]. Neither Onoguchi'440 nor Onoguchi' 483 nor Applicant's Admitted Prior Art

determines the inclinations of said lines on the images.

Storjohann discloses an inverse perspective mapping for detecting an obstacle by projecting the image of a scene onto a plane different from the image plane (Page 761, RC, lines 23-25), by mapping a point in the image plane onto a point in a plane slanted (inclined) by an angel and determines the inclination (page 762, LC, equation 1). The map of free space is the projection of all lines of sights onto a plane representing the floor up to the point where the respective line of sight stops. The inverse perspective mapping offers an efficient way of computing the map of free space for a broad range of applications of automatically detecting an obstacle. An obstacle is modeled as any visible surface patch whose 3D position has a non-vanishing Z component in an XYZ coordinate system with the XY-plane representing the floor (Z=0)

(page 763, RC, lines 16-33, Figs 8, 9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Storjohann teachings to modify the combined system of Onoguchi'440, Onoguchi'483 and Applicant's Admitted Prior Art by determines the inclinations of said lines on the images in order to efficiently computing the map of free space for a broad range of applications of automatically detecting an obstacle.

As to claims 21/18 or 21/19 refer to claim 5/2 or 5/3 rejections.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samir A. Ahmed whose telephone number is 703-305-9870. The examiner can normally be reached on Mon-Fri 8:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on 703-308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SA

SAMIR AHMED
PRIMARY EXAMINER